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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

MAI, ANH D

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 10/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/799,413

Applicant(s)

HUI ET AL.

Examiner

Anh D. Mai

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 August 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 10-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 10-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 August 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Status of the Claims

1. Amendment filed August 2, 2005 has been entered. Claims 6-9 have been cancelled. Claims 1, 4, 10, 11 and 14 have been amended. Claims 1-5 and 10-15 are pending.

Drawings

2. The drawings were received on August 2, 2005. This drawing, Fig. 3G, is acceptable.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-5 and 10-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1, lines 9-11, recites: "etching a portion of said anti-reflective coating layer over said STI region leaving a remaining portion of said anti-reflective coating layer over said STI region and extending beyond the boundaries of said STI region"

How can etching a portion of ARC that lies over the STI region and still leaving the remaining portion of ARC over the STI ?

The claims must meet the threshold requirement of clarity and precision (MPEP 2173.02). Accordingly, as recited in claim 1, the anti-reflective coating layer are fully exposed

Art Unit: 2814

therefore, “etching a portion of said anti-reflective coating layer” would remove the anti-reflective coating layer as a whole.

Once removed, the ARC is *no longer* situated over the STI, however, the limitation seems to indicate that nothing is removed or at most a top portion is removed.

Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Similarly, lines 12-14 recites: “etching an exposed portion of said polysilicon layer and said gate oxide layer over said STI region leaving a remaining portion of said polysilicon layer and said gate oxide layer over said STI region and extending beyond the boundaries of said STI region”.

The similar also applies to claim 10, lines 7-9.

4. Claim 1 recites the limitation “etching an exposed portion of said polysilicon layer and said gate oxide layer over said STI region” in lines 12-13. There is insufficient antecedent basis for this limitation in the claim.

Neither the polysilicon nor the gate oxide **have been exposed**, because the anti-reflective coating layer is still remaining over the STI region and extending beyond the boundaries of the STI region (line 9, depositing an anti-reflective coating layer over said polysilicon layer). (See lines 10-12).

Art Unit: 2814

The following is suggested to clarify the claims and alleviate the indefiniteness:

“selectively etching a portion of the anti-reflective coating layer over said STI region leaving a remaining portion of said anti-reflective coating layer over the edge of said STI region and extending beyond the boundaries of said STI region, to expose a portion of said polysilicon layer”.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 10, 11, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu et al. (U.S. Patent No. 6,197,637) in view of Yang et al. (U.S. Patent No. 6,110,779).

With respect to claim 10, as best understood by the examiner, Hsu teaches a method for avoiding oxide gouging in isolation regions of a semiconductor device substantially as claimed including:

forming an isolating region (230), the isolating region (230) being filled with insulating material;

depositing an anti-reflective coating, hereinafter ARC, layer (241a) over the isolation region (230) and extending beyond the boundaries of the isolation region (230);

Art Unit: 2814

etching a portion (242) of the ARC layer (241a) over the isolation region (230) leaving a remaining portion of the ARC layer (241a) over the isolation region (230) and extending beyond the boundaries of the isolation region (230); and

depositing a protective cap (246) covering the isolation region (230) and extending beyond the boundaries of the isolation region (230), wherein the protective cap (246) covers the remaining portion of the ARC layer (241a) and the insulating material over the isolation region (230). (See Figs. 5B-C).

Thus, Hsu is shown to teach all the features of the claim with the exception of utilizing STI as isolation region.

However, Yang teaches that STI (76) can be alternatively used as isolation regions (see Fig. 4) and the process is well known to include: etching a trench in an STI region; and filling the trench with an insulating material (76). (See Fig. 4).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the isolation region of Hsu utilizing the STI as taught by Yang because STI can be formed with narrow profile and devoid of bird's beak, hence more active surface area, thus more devices can be formed on a given semiconductor surface (ULSI).

Regarding anti-reflective coating or ARC, many materials, such as oxide, nitride and oxynitride, can be used for, or function as, anti-reflective coating. The materials 241a of Hsu or 60 of Yang are one of them.

Art Unit: 2814

With respect to claim 11, the method of Hsu further comprises:

etching a portion of the protective cap (246) to expose the remaining portion of the ARC layer (241a) while maintaining protection of the insulating material (230); and

etching the remaining portion (241) of the ARC layer (241a);

wherein the insulating material (230) is protected during etching of the remaining portion (241) of the ARC layer (241a) by the protective cap (247). (See Figs. 5C-E).

With respect to claim 14, in view of Yang, the remaining portion of the ARC layer (60) can be etched using dry etch, hence plasma etch process.

With respect to claim 15, as best understood by the examiner, the insulating material (230) of Hsu comprises thermal oxide.

6. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu '637 and Yang '779 as applied to claim 10 above, and further in view of Tripsas et al. (U.S. Patent No. 6,034,395).

With respect to claim 12, Hsu teaches depositing a protective cap (246) covering the isolation region (230) and extending beyond the boundaries of the isolation region.

Thus, Hsu is shown to teach all the features of the claim with the exception of depositing protective cap utilizing photoresist material.

However, Tripsas teaches: photoresist material are known to use as a protective cap (40). (See Fig. 3a).

Art Unit: 2814

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to deposit the protective cap of Hsu utilizing photoresist material as taught by Tripsas because the photoresist is deposited by spin-on, thus simplifies the process, hence more through put.

With respect to claim 13, the protective cap (40) of Tripsas is deposited to cover the polysilicon having a thickness of 600 Å to 1100 Å, thus, the protective cap (40) should have a thickness approximately the same.

Note that, the claimed thickness does not appear to be critical.

The specification contains no disclosure of either the *critical nature of the claimed thickness of the photoresist material* of any unexpected results arising therefrom. Where patentability is aid to based upon particular chosen dimension or upon another variable recited in a claim, the Applicant must show that the chosen dimension are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Response to Arguments

7. Applicant's arguments filed August 2, 2005 have been fully considered but they are not persuasive.

Rejection under 35 U.S.C. 112, second paragraph

Applicant contend that the scope of the claimed subject matter in claims 1-5 and 10-15 can be determined by one having ordinary skill in the art.

However, MPEP 2173.02 requires the claim must be clarity and precision. As recited, neither claims 1 nor 10 satisfy that requirement.

One having ordinary skill in the art can only determine the subject matters that are present in the claims rather than referring back to the specification for the subject matters that are missing.

Applicant states: respectfully direct the Examiner's attention to at least page 8, lines 1-3 of the specification and Figure 3B. (Page 15).

The statement in itself clearly require the one having ordinary skill in the art to review the specification for the missing element. Therefore, clarity and precision are clearly lacking.

As clearly indicated that although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). It is noted that the features upon which applicant relies (i.e., a portion of the anti-reflective coating layer 34 was etched over the STI region 14) are not recited in the rejected claim(s).

As discussed above, the terms "selectively etching" and "to expose a portion of said polysilicon layer" are suggested to clarify the subject matter.

Rejection under 35 U.S.C. 103 (a)

Applicant state: the Examiner is relying upon his own subjective opinion which is insufficient to support prima facie case of obvious.

Isolation by LOCOS are well known in the art to form bird's beak which consume silicon under the mask (see Wolf, Silicon Processing for the VLSI Era, Vol. 2, pp. 45-47), consequently

Art Unit: 2814

reduces the area for active device. This is not personal opinion but this is THE KNOWLEDGE OF PERSON OF ORDINARY SKILL IN THE ART. Thus, complies with MPEP 2142, therefore, the prima facie case of obvious has been established.

Further, Yang has already stated: “although Fig. 3C discloses the isolation regions 14a and 14b as field oxidized regions, **the structure may alternatively use** trench isolation structures 76, as shown in Fig. 4” (col. 6, line 24-26), thus, even more obvious.

Regarding claim 12, again, Applicant contend that the motivation to combine is that Examiner’s own.

However, this is well known in the art: depositing material such as oxide, nitride or oxynitride require machinery in a protective environment and the process is slow and costly. Depositing the photoresist material on the other hand is very simple and economical. In case of Tripsas, spin-on deposition is simple and cheap, some time very cheap by using an eye-drop and a spinner, hence spin-on. Since layer 246 of Hsu and layer 40 of Tripsas are used as sacrificial, thus, one having ordinary skill in the art would seek a simplest process and most economical way to do the same task. The choice is obvious.

Since the motivations to combine have been provided, the prima facie case of obvious has been established, thus, the rejections are maintained.

Allowable Subject Matter

8. Claims 1-5 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

This matter has been discussed with Mr. Robert A. Voigt, Jr in a telephone interview initiated by the Examiner on October 14, 2005.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 8:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2814

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



ANH D. MAI
PRIMARY EXAMINER